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Characterization of a plasma photonic crystal using the multi-fluid plasma model[1] WHITNEY THOMAS, URI SHUMLAK, SEAN MILLER, Univ of Washington — Plasma photonic crystals have great potential to expand the capabilities of current microwave filtering and switching technologies by providing high speed control of energy band-gap/pass characteristics. While there has been considerable research into dielectric, semiconductor, metallic, and even liquid crystal based radiation manipulation, using plasmas is a relatively new field. Concurrently, processing power has reached levels where realistic, computationally expensive, multi-fluid plasma simulations are now possible. Unlike single-fluid magnetohydrodynamic (MHD) models, multi-fluid plasma models capture the electron fluid response to electromagnetic waves, a key process responsible for reflecting radiation. In this study, a 5-moment multi-fluid plasma model is implemented in University of Washington's WARPXM computational plasma physics code to examine the energy band-gap characteristics of an array of plasma-filled rods. This configuration permits the thorough analysis of the effect that plasma temperature, density, and array configuration have on energy transmission, absorption, and reflection. Furthermore, high-resolution simulations of the plasma columns gives a detailed window into plasma-radiation interactions.

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